

IS CHEMURGY A MISSING LINK IN THE ADVANCEMENT TO CIRCULAR ECONOMY?

Janusz Gołaszewski

Center for Renewable Energy Research, University of Warmia and Mazury in Olsztyn, Poland,
janusz.golaszewski@uwm.edu.pl

ABSTRACT

The paper discusses the place of chemurgy within the framework of circular economy. It has been evidenced that evolving changes in environmental policy are an outcome of the current economic activities carried out in accordance with the principle of ‘making – using – disposing’. This means that as the human population grows, a tendency appears towards larger production of goods and services, which stimulates higher energy use and waste generation, and this in turn causes a depletion of natural resources. A circular economy creates a sustainable and low-emission economy system, in which any marketable products will make a closed cycle of materials and energy flow. In the context of circular economy, chemurgy composes the link between the chemistry and agricultural sectors by transformation of agricultural raw materials to industrial bioproducts (biochemicals, biomaterials, biofuels, bioenergy). All the processes of conversion of agricultural raw material into industrial products tend to be canalized in the concept of biorefinery, which seems to be the pivotal installation for the future market of bioproducts – bioeconomy. At the same time, bioproducts will substitute products derived from nonrenewable sources (petrochemicals). The role of chemurgy is to build effective chemical routes for the transformation of biomass to different chemical platforms. The main biobased platforms are discussed in the paper. These are: syngas, pyrolytic oil, biooil (vegetable, algae), biogas, C5 and C5/C6 sugars, pulp, and lignin.

It has been stated that chemurgy in the concept of a biorefinery facility is relatively new. Many biorefining processes require an integrated multidisciplinary research approach, but at the same time, research on biorefineries creates an opportunity to develop new multidisciplinary knowledge strongly associated with applied chemistry and agricultural sciences. Instead of chemurgy, there are various emerging new sciences that will support the implementation of biorefineries in the market, including white and blue biotechnology, seagriculture, biomimetics, ecoenergetics, and finally bioeconomy.